INDEX.

VOLUME LXVII.

(VOLUME VII, NEW SERIES.)

1893.

ILLUSTRATIONS.

A Modern Boiler Plant, 44.
American and English Locomotives: Axles, 165; 167; Boiler, 59; Crank-pins, 165, 168; Cylinders, 219 Driving and Trailing Springs, 167; Driving Axle Boxes, 165, 167; Driving Wheels, 165; Engine Truck, 371; Exhaust Pipes, 417; Furnaces, 116; General Description, 8; Pistons, 219; Rods, 317; Running Gear, 466; Smoke Boxes, 417; Specification of American Locomotives, 560; Spring Gear, 168; Springs, 166; Steam Pipe, 417; Tanks, 466; Tender Frames, 466; Tires, 166; Valve Motion, 263; Valves, 219.
Ammen Ram Katahdin, The, 117.
Apparatus for Oiling Locomotive Axle Boxes, 518.
Arbel's Wheels, 492.
Armington & Sims' Tandem Compound Engine, 152.
Asbestos Pipe Covering, 503.
Ash Ejector, See's Hydro-Pneumatic, 602.
Ashley's Counterbalance Low-Water Column, 307.
Austin Locomotive Stone Breaker, 208.
Austrian Ties and Track, 103.

Balanced Slide Valve, 330.
Balloons, The Steering of, 389, 425, 473.
Band Resawing Machine, 153.
Beamless Brake, The, 306.
Block Signals, Patenall's Improved Sykes' System of, 215, 273, 322, 374.
Blowing Engines, 470.
Bogert's Improved 20-in. Engine Lathe, 207.
Boies Steel Wheel, The Manufacturing of the, 551.
Boiler, A New Water Tube, 47.
Boilers, Down-Draft Furnaces for Steam, 70.
Boiler Improvement, Locomotive, 260.
Boiler, Poole's Horizontal, 155.
Boiler, The Bork Construction of Locomotive, 420.
Boiler, The Smith Water Tube, 97.
Boiler Tubes, 209.
Bolt Heading Machine, Improved, 255.
Boring and Turning Mill, New 62-in., 256.
Boring Mill, Robert Poole & Son Company's Large, 203.
Bork Construction of Locomotive Boiler, 420.
Bridge at Rome, Garibaldi, 33.
Brown Wire-wound Gun, 483.
Buffer, Leonard's Hydrostatic, 483.

Canal, A Japanese, 26.
Canal, Works on the Ganges, 24.
Car 'Exhibit of the Harlan & Hollingsworth Company at Chicago, 285.
Car for Carrying Heavy Guns, 218.
Car for Ceylon Government Railways, Iron Flat, 269.
Car of Liverpool Overhead Railway Passenger, 193.
Car-wheel Flanges, 139.
Cast Steel in the Manufacture of Different Parts of Locomotives, The Use of, 382.
Caucasus Range, The Government New Location for the Railroad across the Main, 585.
Centurion, The, 196.
Columbian Exposition, 68.
Columbian Metallic Railway Tie, 550.
Combination of Stow Flexible Shaft and Electric Motor, 307.
Comparative Test of the Westinghouse Air Brake Company's 9½-in. Air Pump and the N. Y. Air Brake Company's No. 2 Duplex Air Pump, 504.
Compound Express Locomotive for the Northern Railway of France, 114.
Compound Express Passenger Locomotive for the P. L. & Med. Railway, Four Cylinder, 295.
Compound Locomotives, Mallet System of Duplex, 225.
Compound Locomotive of the Schenectady Locomotive Works, 271.
Compound Locomotive with Vestibuled Tender, 317.
Condensation of Steam in Steam Engines, 287.
Consolidated Car Heating Company's Electric Meter, 302.
Contributions to Practical Railroad Information: Method of Determining Free Caustic and Carbonated Alkali in Soaps, 199; Method of Determining Carbon in Iron and Steel, 347; Method of Determining Sulphur in Steel, 413.
Coupling Rods, The Action of Driving Boxes and, 458.
Crane, A New Shop, 208.
Crank-Pin Press, 330.
Crossings of Great Rivers, 239.
Cruiser Brooklyn, 89.
Cyclogram of Pressures in Steam Engines, 327.

Dam, A Simple, 52.
Delaney's Coil and Ring Packing and Gaskets, 203.
Delaware & Hudson Canal Company's Railroad, Special Tools of the: Axle Lubricator, 518; Balanced Slide Valve, 330; Barrel Rack for Oil House Crane, 223; Crane for Oil House, 224; Crank-pin Press, 330; Exhaust Tip Reamer, 380; Furnace Door, 476; Hoisting Tub, 575; Hook Jack, 381; Hydraulic Elevator at Plattsburgh Depot, 517; Hydraulic Locomotive Lift, 331; Hydraulic Wheel Press, 224; Link Grinder, 476; Oil-Box Jack, 477; Swinging Coaling Shute, 224; Traveling Jack, 380; Universal Milling Machine, 379.
Detection of Weak Smoke Tubes in Tram Locomotives, 365.
Down-Draft Furnaces for Steam Boilers, 70.
Doxford's Cargo Steamer, 455
Draining of the Zuyder Zee, 75.
Drawing Pen, Reservoir, 357.
Driving Boxes and Coupling Rods, The Action of, 458.
Dust Collector for Wood-Working Ships, 48.

Electric Car Lighting on the Jura-Simplon Railway, The System of, 191.
Electric Heater, Consolidated Car Heating Company's, 302.
Electric Lighting on the Trains of the Paris, Lyons & Mediterranean Railway, 342.
Electric Locomotive, 214.
Engine, A Horizontal Compound, 72.
Engine, An Electric Railroad, 255.
Engine, An English Vertical High Speed, 104.
Engine, A New Vertical Compound, 41.
Engine, A Quadruple-Expansion Marine, 30.
Engine, Armington & Sims' Tandem Compound, 152.
Engines, A Ship with Gasoline, 41.
Engine for Electric Work, 99.
Engine, The First Triple-Expansion Marine, 81.
Engine, The Wells, 358.
Engines, Blowing, 470.
English Locomotives, American and, 8, 59, 116, 165, 219, 263, 317, 371, 417, 466, 516, 560.
Ericsson Submarine Gun, The, 227.
Exhaust Nozzle, A Peculiar, 127.
Exhaust Tip Reamer, 381.
Expanding Tires with the Wells Light, 150.
Experience with a 24-in. Gas Main, 277.
Express Passenger Engine for Lehigh Valley Railroad, 531.
Express Passenger Engine, London, Chatham & Dover Railway, 282.
Extension Front, Delaware & Hudson Canal Company's Railroad, 268.

Fastenings of Rails to Wooden Ties, 435.
Flush Transfer Table, 408.
Flying Machine, Hargrave's, 233.
Flying Machines, Progress in, 37, 83, 134, 243, 293, 339, 445, 479.
Forrest Silver-Bronze Packing, 95.
Foster Engineering Company's Improved Safety Check Valve, 549.
Fougere Nut Lock, 48.
Foundry Crane, A, 549.
Four-Winch Hoist, 308.
Freight Engines of the Belgium State Railways, Standard, 385.
Freight Station in St. Louis, Franklin Avenue, 378.
Frick's Refrigerating Machine, 385.
Fuel on the French, English and Belgian Railways, The Handling of, 521.
Furnaces for Steam Boilers, Down-Draft, 70.
Furnace Door, 476.

Ganges Canal, Works on the, 24.
Garibaldi Bridge at Rome, 33.
Gas Main, Experience with a 24-in., 277.
Glossop Pneumatic Hammer, 456.
Grand Central Railway of Belgium, Metallic Ties on the, 569.
Gun, The Ericsson Submarine, 227.

Hargrave's Flying Machine, 233.
Hook Jack, 381.
Horizontal Car Borer, 46.
Hydraulic Elevator at Plattsburgh Depot, 517.
Hydraulic Locomotive Lift, 331.
Hydraulic Rail Punch, 99.
Hydraulic Power in London, 124.
Hydrometric Apparatus of Amsler, 239.
Hydro-Pneumatic Ash Ejector, See's, 602.

Iron Flat Car for Ceylon Government Railways, 269.
Iron Tender Frame, Philadelphia & Reading Railroad, 563.
Iron Works in America, The First, 32.
Irrigation in India, 21, 87.

Jack's Run Viaduct, 345.
Japanese Canal, A, 26.
Japanese Railways, 390.

INDEX.

VOLUME LXVII.

(VOLUME VII, NEW SERIES.)

1893.

ILLUSTRATIONS.

A Modern Boiler Plant, 44.
American and English Locomotives: Axles, 165; 167; Boiler, 59; Crank-pins, 165, 168; Cylinders, 219 Driving and Trailing Springs, 167; Driving Axle Boxes, 165, 167; Driving Wheels, 165; Engine Truck, 371; Exhaust Pipes, 417; Furnaces, 116; General Description, 8; Pistons, 219; Rods, 317; Running Gear, 466; Smoke Boxes, 417; Specification of American Locomotives, 560; Spring Gear, 168; Springs, 166; Steam Pipe, 417; Tanks, 466; Tender Frames, 466; Tires, 166; Valve Motion, 263; Valves, 219.
Ammen Ram Katahdin, The, 117.
Apparatus for Oiling Locomotive Axle Boxes, 518.
Arbel's Wheels, 492.
Armington & Sims' Tandem Compound Engine, 152.
Asbestos Pipe Covering, 503.
Ash Ejector, See's Hydro-Pneumatic, 602.
Ashley's Counterbalance Low-Water Column, 307.
Austin Locomotive Stone Breaker, 208.
Austrian Ties and Track, 103.

Balanced Slide Valve, 330.
Balloons, The Steering of, 389, 425, 473.
Band Resawing Machine, 153.
Beamless Brake, The, 306.
Block Signals, Patenall's Improved Sykes' System of, 215, 273, 322, 374.
Blowing Engines, 470.
Bogert's Improved 20-in. Engine Lathe, 207.
Boies Steel Wheel, The Manufacturing of the, 551.
Boiler, A New Water Tube, 47.
Boilers, Down-Draft Furnaces for Steam, 70.
Boiler Improvement, Locomotive, 260.
Boiler, Poole's Horizontal, 155.
Boiler, The Bork Construction of Locomotive, 420.
Boiler, The Smith Water Tube, 97.
Boiler Tubes, 209.
Bolt Heading Machine, Improved, 255.
Boring and Turning Mill, New 62-in., 256.
Boring Mill, Robert Poole & Son Company's Large, 203.
Bork Construction of Locomotive Boiler, 420.
Bridge at Rome, Garibaldi, 33.
Brown Wire-wound Gun, 483.
Buffer, Leonard's Hydrostatic, 483.

Canal, A Japanese, 26.
Canal, Works on the Ganges, 24.
Car 'Exhibit of the Harlan & Hollingsworth Company at Chicago, 285.
Car for Carrying Heavy Guns, 218.
Car for Ceylon Government Railways, Iron Flat, 269.
Car of Liverpool Overhead Railway Passenger, 193.
Car-wheel Flanges, 139.
Cast Steel in the Manufacture of Different Parts of Locomotives, The Use of, 382.
Caucasus Range, The Government New Location for the Railroad across the Main, 585.
Centurion, The, 196.
Columbian Exposition, 68.
Columbian Metallic Railway Tie, 550.
Combination of Stow Flexible Shaft and Electric Motor, 307.
Comparative Test of the Westinghouse Air Brake Company's 9½-in. Air Pump and the N. Y. Air Brake Company's No. 2 Duplex Air Pump, 504.
Compound Express Locomotive for the Northern Railway of France, 114.
Compound Express Passenger Locomotive for the P. L. & Med. Railway, Four Cylinder, 295.
Compound Locomotives, Mallet System of Duplex, 225.
Compound Locomotive of the Schenectady Locomotive Works, 271.
Compound Locomotive with Vestibuled Tender, 317.
Condensation of Steam in Steam Engines, 287.
Consolidated Car Heating Company's Electric Meter, 302.
Contributions to Practical Railroad Information: Method of Determining Free Caustic and Carbonated Alkali in Soaps, 199; Method of Determining Carbon in Iron and Steel, 347; Method of Determining Sulphur in Steel, 413.
Coupling Rods, The Action of Driving Boxes and, 458.
Crane, A New Shop, 208.
Crank-Pin Press, 330.
Crossings of Great Rivers, 239.
Cruiser Brooklyn, 89.
Cyclogram of Pressures in Steam Engines, 327.

Dam, A Simple, 52.
Delaney's Coil and Ring Packing and Gaskets, 203.
Delaware & Hudson Canal Company's Railroad, Special Tools of the: Axle Lubricator, 518; Balanced Slide Valve, 330; Barrel Rack for Oil House Crane, 223; Crane for Oil House, 224; Crank-pin Press, 330; Exhaust Tip Reamer, 380; Furnace Door, 476; Hoisting Tub, 575; Hook Jack, 381; Hydraulic Elevator at Plattsburgh Depot, 517; Hydraulic Locomotive Lift, 331; Hydraulic Wheel Press, 224; Link Grinder, 476; Oil-Box Jack, 477; Swinging Coaling Shute, 224; Traveling Jack, 380; Universal Milling Machine, 379.
Detection of Weak Smoke Tubes in Tram Locomotives, 365.
Down-Draft Furnaces for Steam Boilers, 70.
Doxford's Cargo Steamer, 455
Draining of the Zuyder Zee, 75.
Drawing Pen, Reservoir, 357.
Driving Boxes and Coupling Rods, The Action of, 458.
Dust Collector for Wood-Working Ships, 48.

Electric Car Lighting on the Jura-Simplon Railway, The System of, 191.
Electric Heater, Consolidated Car Heating Company's, 302.
Electric Lighting on the Trains of the Paris, Lyons & Mediterranean Railway, 342.
Electric Locomotive, 214.
Engine, A Horizontal Compound, 72.
Engine, An Electric Railroad, 255.
Engine, An English Vertical High Speed, 104.
Engine, A New Vertical Compound, 41.
Engine, A Quadruple-Expansion Marine, 30.
Engine, Armington & Sims' Tandem Compound, 152.
Engines, A Ship with Gasoline, 41.
Engine for Electric Work, 99.
Engine, The First Triple-Expansion Marine, 81.
Engine, The Wells, 358.
Engines, Blowing, 470.
English Locomotives, American and, 8, 59, 116, 165, 219, 263, 317, 371, 417, 466, 516, 560.
Ericsson Submarine Gun, The, 227.
Exhaust Nozzle, A Peculiar, 127.
Exhaust Tip Reamer, 381.
Expanding Tires with the Wells Light, 150.
Experience with a 24-in. Gas Main, 277.
Express Passenger Engine for Lehigh Valley Railroad, 531.
Express Passenger Engine, London, Chatham & Dover Railway, 282.
Extension Front, Delaware & Hudson Canal Company's Railroad, 268.

Fastenings of Rails to Wooden Ties, 435.
Flush Transfer Table, 408.
Flying Machine, Hargrave's, 233.
Flying Machines, Progress in, 37, 83, 134, 243, 293, 339, 445, 479.
Forrest Silver-Bronze Packing, 95.
Foster Engineering Company's Improved Safety Check Valve, 549.
Fougere Nut Lock, 48.
Foundry Crane, A, 549.
Four-Winch Hoist, 308.
Freight Engines of the Belgium State Railways, Standard, 385.
Freight Station in St. Louis, Franklin Avenue, 378.
Frick's Refrigerating Machine, 385.
Fuel on the French, English and Belgian Railways, The Handling of, 521.
Furnaces for Steam Boilers, Down-Draft, 70.
Furnace Door, 476.

Ganges Canal, Works on the, 24.
Garibaldi Bridge at Rome, 33.
Gas Main, Experience with a 24-in., 277.
Glossop Pneumatic Hammer, 456.
Grand Central Railway of Belgium, Metallic Ties on the, 569.
Gun, The Ericsson Submarine, 227.

Hargrave's Flying Machine, 233.
Hook Jack, 381.
Horizontal Car Borer, 46.
Hydraulic Elevator at Plattsburgh Depot, 517.
Hydraulic Locomotive Lift, 331.
Hydraulic Rail Punch, 99.
Hydraulic Power in London, 124.
Hydrometric Apparatus of Amsler, 239.
Hydro-Pneumatic Ash Ejector, See's, 602.

Iron Flat Car for Ceylon Government Railways, 269.
Iron Tender Frame, Philadelphia & Reading Railroad, 563.
Iron Works in America, The First, 32.
Irrigation in India, 21, 87.

Jack's Run Viaduct, 345.
Japanese Canal, A, 26.
Japanese Railways, 390.

ILLUSTRATIONS.

Katahdin, The Ammen Ram, 117.

Lake Passenger Steamers, New, 128.
Lathe, Bogert's Improved 20-in. Engine, 207.
Lead-Pencils, 524.
Leonard's Hydrostatic Buffer, 483.
Life-Saving Service, 33.
Link Grinder, 476.
Locomotive, A Russian Compound Passenger, 71.
Locomotive Boiler Improvement, 260.
Locomotive Boiler, The Bork Construction of, 420.
Locomotive by the Rogers Locomotive and Machine Works, Compound, 13.
Locomotive, Electric, 214.
Locomotive for Lehigh Valley Railroad, Express Passenger, 531.
Locomotive for the Lake Shore & Michigan Southern Railway, Fast Passenger, 321.
Locomotive for the Northern Railway of France, Compound Express, 114, 180.
Locomotive for the P. L. & Med. Railway, Four-Cylinder Compound Express Passenger, 295.
Locomotive for Suburban Traffic, An English, 152.
Locomotive in America, First, 13.
Locomotive Lift, Hydraulic, 331.
Locomotive, London, Chatham & Dover Railway, Express Passenger, 282.
Locomotive of the Schenectady Locomotive Works, Compound, 271.
Locomotive, Ten-Wheeled Passenger, 577.
Locomotive, The Latest English Freight, 79.
Locomotive, Thirty-ton Electric, 405.
Locomotive with Vestibuled Tender, Compound, 317.
Locomotives, American and English, 116, 165, 219, 263, 317, 371, 417, 466, 560.
Locomotives, American and English, Tank, 516.
Locomotives Hurricane and Thunderer, 328.
Locomotives, Mallet System of Duplex Compound, 225.
Locomotives of the Belgium State Railways, Standard Freight, 385.
Locomotives, Ordinary Types of Belgium State Railway, 288.
Locomotive Problem again, 27.
Locomotive Problem, The, 178.
Locomotive Sand-Dryer, 308.
Locomotive Shops, A Plan for, 28.
Locomotive Stone Breaker, Austin, 208.
Locomotive with the Largest Driving Wheels, 81.
Lunken Gate Valve, The, 454.

Mack's Boiler Circulator, 407.
Mallet System of Duplex Compound Locomotives, 225.
Manganese Steel, 234, 278.
Mannlicher Rifle, The New, 27.
Manufacturing of the Boies Steel Wheel, 551.
Marine Engine, The First Triple-Expansion, 81.
Maxon Jack, 204.
Mechanical Flight, 231.
Metallic Ties on the Belgian State Railways, Tests of, 427.
Metallic Ties on the Grand Central Railway of Belgium, 569.
Metallic Ties, Uses of, 393.
Minneapolis, The United States Cruiser, 438.
Monterey, The, 89.
Morgan Mortar Mounting, 103.
Mortar Mounting, The Morgan, 103.
Multiple Circuit Hot-Water System, 98.

New Screw Pitch Gauge, 453.
Nikko Temples, 433.

Oil-Box Jack, 477.
Olympia, U. S. Protected Cruiser, 335.
Ordinary Types of Belgium State Railway Locomotives, 288.

Packing, The Forrest's Silver-Bronze, 95.
Paint Shops of the Chicago, Burlington & Quincy Railroad, Aurora, Ill., 197.
Passenger Car Exhibit of the Harlan & Hollingsworth Company, at Chicago, 285.
Passenger Station at Portland, Me., Union, 243.
Patenall's Improved Sykes' System of Block Signals, 215, 273, 322, 374.
Philadelphia & Reading Shops at Reading, 518.
Phillips' Flying Machine, 271.
Pile-Driver, A Russian Steam, 133.
Pontooning through the St. Lawrence Canals, 280.
Portland, Me., Union Passenger Station at, 243.
Pressure Casting Process, The Smith, 177.
Progress in Flying Machines, 37, 83, 134, 243, 293, 339, 395, 445, 479, 532.
Pumping Engine, A Large, 19.
Punching and Shearing Machine, A 60-in., 259.

Quadruple-Expansion Marine Engine, 30.

Radial Reversible Car-Borer, 306.
Railroad Across the Main Caucasus Range, The Government New Location for the, 585.
Reading Shops of the Philadelphia & Reading Railroad, Special Tools at the, 572; Crank Pin Cutter, 572; Crosshead Jack, 574; Driving Box Chuck, 572; Jack for Car Inspectors, 574; Piston-Rod Jack, 574.
Reservoir Drawing Pen, 357.
Resistance of Metals to Shear, 141, 179, 247.
Riveted Joints, 76.
Robert Poole & Son Co.'s Works, 92.

Safety Plate under Running Board, 366.
See's Hydro-Pneumatic Ash Ejector, 602.
Shells with High Explosives, 123, 175.
Ship with Gasoline Engines, 41.
Side Wheel Yacht, 52.
Some Handy Tools, 100.
Smith Pressure Casting Process, The, 177.
Smith Water-Tube Boiler, 97.
Standard Fire Pump, 150.
Starrett's New Tools, 203.
Station of the N. Y., Ontario & Western Railroad, The Liberty, 196.
Stayless Boilers and Steel Fire-Boxes, Experiments with, 484.
Steamer Virginia, The Twin Screw, 230.
Steamship Campania, The Cunard Company's New Twin Screw, 129.
Steam Steering Gear, 484.
Steering of Balloons, 389, 425, 473.

Tender, A Vestibule, 369.
Tender Frame, Iron, Philadelphia & Reading Railroad, 563.
Ten-Wheeled Passenger Locomotive, 577.
Test of Cut and Wire Nails, 307.
Tests of Metallic Ties on the Belgian State Railways, 427.
Tests of Metallic Ties on the Eastern Railway of France, 524.
Ties and Track, Austrian, 103.
Ties on the Eastern Railway of France, Tests of Metallic, 524.
Ties on the Grand Central Railway of Belgium, Metallic, 569.
Ties, Uses of Metallic, 393.
Torpedo Cruiser, An English, 76.
Torsion Viscosimeter, The, 583.
Traveling Jack, 381.
Tunneling Shield, A New, 153.
Turret Ship Construction, Twenty Years' Progress in, 377.
Twelve-inch Breech-Loading Rifle Mortars, 454.
Twenty Years' Progress in Turret Ship Construction, 377.
Twin-Screw Steamer for Lake Titicaca, 371.

United States Cruiser Minneapolis, 438.
United States Protected Cruiser Olympia, 335.
Universal Electric Conduit, 502.
Universal Milling Machine, 379.

Valve-Motion Indicator used on the Baltimore & Ohio Railroad, 539.
Valve-Rod Guide, Delaware, Lackawanna & Western Railroad, 575.
Vasco da Gama's Ship, the San Gabriel, 283.
Vertical Cutting-Off Saw, 406.
Vestibule Tender, A, 369.
Viaduct, Jack's Run, 345.
Viscosimeter, The Torsion, 583.

Wells Engine, The, 358.
Westinghouse Air-Brake Company's Exhibit, 405.
Wheeler & Company's One Hundredth Vessel, 196.
Wing's Disk Fan, 156.

Zuyder Zee, Draining of, 75.

EDITORIALS.

Accidents to Locomotive Engineers and Firemen, 457, 505.
Aerial Navigation, 53.
Aerial Navigation Convention, 409.
American Pig Irons Displacing English and Scotch, 209.
American Society of Mechanical Engineers, Meeting of, 553.
Announcement, 1.
Armor Plate Tests, 359.
Armor, Recent Inventions in, 55.
Armor Trial, The Ochta, 56.
Annual Coal Production of the World, 209.
Architects and Engineers, 53.
Armor, Recent Inventions in, 55.
Aspiring Merit, 507.

Balloon, La France, 53.
Boiler Tubes, 209.
Bridge Construction, The, 261.

Car Lighting, Electric, 261.
Coaling Steamers at Sea, 505.
Collision between the Ravenna and Chishima-Kan, 53.
Collision of Steamer Ravenna, 53.
Columbia, Trial of the, 553.
Comforts of Railroad Travel, 157.
Complaint of Insufficient Trains on the New York Elevated Railroads, 457.
Compound Locomotives, 310.
Compound Locomotive, 261.
Connections, Locomotive and Tender, 54.
Contributors, Potential, 261.
Corinth Canal, 359.
Crushers at Hard Ore Mines, 209.
Cylinder Proportions, 410.

Detentions on Railroads from Defects in Locomotives, 505.
Editorial Announcement, 53.
Editorial Notes, 1, 105, 157.
Eighteen Hundred and Ninety-four, 553.
Eighteen Hours between New York and Chicago, 209.
El Cid, 553.
Electric Car Lighting, 261.
Elevated Railroads, Complaint of Insufficient Trains on the New York, 457.
Employers' Liability Act, 409.
Engineers and Architects, 53.
English Freight Rates, 359.
Excess Charges at Chicago, 209.

Fast Vessels for the Lakes, 209.
Freight Rates, English, 359.
Freight Steamers for the Lakes, 505.
French Exposition of 1900, 309.

Gauge of Wheels and Rails, 105.
Good Roads, 209.
Good Roads, National League Corps, 53.
Gun Giving High Initial Velocity, 309.

Horse Power of a Locomotive, 3.

Inter-Continental Railway, 359.
Inventors' Academy, Parisian, 56.

Large Atlantic Liners, 261.
Locomotive and Tender Connections, 54.
Locomotive, Compound, 261.
Locomotive, The Horse Power of, 3.
Locomotives, Compound, 310.
Locomotives, Detentions on Railroads from Defects in, 505.
Loss of the Victoria, 359.

Magazine Arms Trial, 261.
Master Car-Builders' Convention, The Work of, 311.
Master Mechanics' Assoc., Ex. Com. Report on Standards, 53.
Master Mechanics' and Master Car-Builders' Assoc., Joint Committee on Meeting, 53.
Master Mechanics' Association, Work of, 359.
Monthly Meeting of Mechanical Engineers for Technical Discussion, 409.

National League for Good Roads, Convention, 53.
Naval Construction, 457.
New York and Chicago, Eighteen Hours between, 209.
New York Rapid Transit Franchise, 53.

Ochta Armor Trial, The, 56.
Oil as Fuel, 309.

Parisian Inventors' Academy, 56.
Peary Expedition, 359.
Potential Contributors, 261.

Railroad Clippings, 457.
Railroad Travel, Comforts of, 157.
Rail Sections, Standard, 411.
Rails, Gauge of Wheels and, 105.
Rapid-Fire Guns, Trial of, 505.
Rapid Transit Franchise, 53.
Rapid Transit in New York, 261, 409.
Recent Inventions in Armor, 55.

Siberian Railroad, The, 2.
Smoke Protection for Torpedo Boats, 457.
Standard Rail Sections, 411.
Steamship Accommodations, 309.
Steamship, Thirty-Knot, 309.
Submarine Torpedo Boat, 359, 409, 505.

EDITORIALS.

Telautograph, The, 209.
Telegraphic Communication with Lightships, 505.
Telephone in Turkey, 409.
Telephone Line, Long Distance, 261.
Thirty-Knot Steamship, 309.
Topheavy Ships, 553.
Trial of Rapid-Fire Guns, 505.
Trolley on the Erie Canal, 309.
Tubes, Boiler, 209.
Use of the Telephone in Turkey, 409.
Vesuvius Trial, 309.
Wheels and Rails, Gauge of, 105.

NEW PUBLICATIONS.

Acme Machinery Company, Catalogue of the, 315.
Addresses Delivered before the World's Railway Commerce Congress, 509.
Addyston Pipe and Steel Company Catalogue, 556.
Aller, A., Catalogue of, 362.
Almy Water-Tube Boiler Company, 162.
Alternating Currents of Electricity, their Generating Measurement, Distribution, and Application, 263.
Aluminum Drawing Instruments, 556.
American Railroads as Investments, 214, 313.
Annual Report of the Chief of Engineers, United States Army, to the Secretary of War, for the Year 1892, 263.
Annual Report of the Chief of the Bureau of Statistics, Treasury Department, upon the Foreign Commerce of the U. S. for the Year ending June 30, 1892, 58.
Annual Report of the Chief of the Bureau of Steam Engineering, Navy Department, for the Year 1892, 108.
Annual Report of the Postmaster-General of the United States for the Fiscal Year ending June 20, 1892, 7.
American Society of Naval Engineers, Journal of, 7.
Annual Report of the State Board of Arbitration of the Commonwealth of Massachusetts for the Year 1892, 162.
Arena, The, 6.
Arena, 57.
Armington & Sims Engine Company, 316.
Artificial Limbs, 556.
A Story of To-Day; Sioux City, its Commerce and Manufactures, 59.
Athol Machine Co. Catalogue, 58.
Atmospheric Resistance, and its Relations to the Speed of Railway Trains, 58.
Atmospheric Resistance, and its Relations to the Speed of Railway Trains, with an Improved System of Heating and Ventilating Cars, 109.

Beeson's Inland Marine Directory, 263, 411.
Bennett Manufacturing Co., 510.
Berlin Bridge Company, 510.
Berry & Orton Co., Illustrated Catalogue of, 315.
Bliss Co., E. W., 413.
Bloomsburg Car Company, Catalogue of, 460.
Books Received, 58, 110, 161, 214, 263, 315, 362, 412, 509.
Brake Pressure Regulator Company, 459.
British Railways, 509.
Brooks Locomotive Works, 413.
Brown & Sharpe Manufacturing Company, 363, 459.
Brush as a Factor in the Various Arts, 556.
Builders' Iron Foundry, Catalogue of the, 363.
Bucyrus Steam Shovel and Dredge Company, Catalogue of, 510.
Buildings and Structures of American Railroads, 161.
Bulletin du Société Royale Belge de Géographie, 110.
Bulletin of the United States Geological Survey, 412.
Bureau of Medicine and Surgery, Report of Chief of, 58.
Bureau of Mines, Second Report of, 555.
Bureau of Statistics, Report of, 58.
Bush Cattle Guard Co. Souvenir, 58.

Cab and Caboose, 5.
Calorimeters, Throttling and Separating, 362.
Car-Heating Apparatus Catalogue, 556.
Case Engine Company, The J. T., 364.
Chapman Valve Manufacturing Company's Catalogue, 412.
Cincinnati Corrugating Company, 460.
Civil Engineers' Field Book, 555.
Classified Illustrated Catalogue of the Library Bureau, 314.
Coal Trade, The, 263, 411.
Cold Saw Cutting-Off Machine, 362.
Cold Saw Cutting-Off Machines, Catalogues and Testimonials of, 413.
Columbian Daily Calendar, 7.
Commissioner of Labor, Fifth Special Report of the, 555.
Commissioner of Labor, Sixth Special Report of the, 555.
Comparison of the Practical Results Obtained by the Use of the Wrought-Iron Forged Wheels, as Made by the Arbel's Establishments, and the Wheels of Several American Types, 414.
Connelly's Improved Mechanical Devices, 555.
Compound Locomotives, 509.
Consolidated Car Heating Company, Albany, N. Y., Catalogue of the, 7.
Consolidated Car-Heating Company, 58, 315.
Consolidated Car-Heating Company, Catalogue of, 162.
Consular Reports, 555.
Continuous Current Dynamos and Motors, their Theory, Design and Testing, 510.
Cranes and Special Railway Appliances, 510.
Current Reading, 110, 263.

Deitz Drawbar Companies, Catalogue of, 162.
Der Brückenbau, 508.
Description of the Lawrence Scientific School of Harvard University, 315.
Descriptive and Illustrated Catalogue of the Pratt & Whitney Company, 414.
Dodge Manufacturing Company, The, 511.
Duty Trial of a Fly-Wheel, High Duty, Automatic Cut-Off, Cross-Compound Pumping Engine, Built by Geo. F. Blake Manufacturing Company, 58.

Eclectic Magazine, 7, 57.
Electrical Measurement and other Advanced Primers of Electricity, 214.
Electrical Wiremen, Standard Tables for, 555.
Electricity and Magnetism, 6.
Electricity up to Date, 412.
Electric Transmission of Intelligence, and other Advanced Primers of Electricity, 362.
Engineering Magazine, 7, 57.
Engineering Works in St. Louis and Vicinity, 362.
Engineers' Surveying and Astronomical Instruments, Catalogue of, 555.
Engineers' Surveying Instruments, their Construction, Adjustment and Use, 5.
Evolution of Artificial Light, The, 511.
Example of a Modern Boiler Plant, 110.
Exhibit of Locomotives by Baldwin Locomotive Works, 362, 414.
Exhibit of Locomotives by Brooks Locomotive Works, 362.

Fifth Special Report of the Commissioner of Labor, 510.
First Steam Screw Propeller Boats to Navigate the Waters of any Country, 509.
Foster Steam Pressure Regulators, Pump Governors and Reducing Valves, Descriptive Catalogue of the, 162.
Fraser & Chalmers, Introductory Catalogue of, 363.
Fraser & Chalmers, of Chicago, 413.

General Catalogue of Worthington Pumping Engines, Steam Pumps and Hydraulic Machinery, 413.
Godey's Magazine, 6, 57.
Goldthwaite's Geographical Magazine, 7, 57.
Good Roads, 7.
Gould Coupler Company, Catalogue of, 510.
Grant's Gear Book for 1892, 363.
Great Lakes Register of Shipping, 263, 412.

Hand-Book of the American Republics, 315.
Harper's Magazine, 6, 57.
Harper's Weekly, 7, 57.
Harrisburg Ideal Automatic Self-Oiling Engines, Simple and Compound, Illustrated Catalogue of, 110.
Heisler's Geared Locomotives, Catalogue of, 162.
How to Select Drawing Instruments, 510.
How to Use Portland Cement—The Buckeye Portland Cement Company, Bellefontaine, O., Catalogue of, 7.
Hunt Company, of New York, The C. W., 413.
Hunt Company, The C. W., 460.
Hydraulic and Rolling Mill Machinery, H. V. Loss, Hydraulic Engineer, Philadelphia, Catalogue of, 7.
Hydraulic Jacks, Screw and Lever Jacks, Catalogue of Improved, 58.

Inclined Plane for the Transfer of Canal Boats at Beauval, near Meaux, 7.
Infantry Drill Regulations, United States Army, 162, 214.
Interstate Commerce Commission, Sixth Annual Report, 58.
Interstate Commerce Commission, Fourth Annual Report of the Statistics of Railways of the United States, 510.

John Fritz Receives the Bessemer Medal, 365.
Journal of Political Economy, 57.
Journal of the American Society of Naval Engineers, 162.
Journal of the Military Service Institution, 57, 162.
Journal of the United States Artillery, 57, 162.

Knots, Splices, Hitches, Bends and Lashings, 263, 412.

Labor-Saving Patent Wood-Working Machinery, Illustrative Descriptive Catalogue of, 364.
La Republique de l'Uruguay, 555.
Law of Incorporated Companies Operating under Municipal Franchises, 508.
Light Cars, 412.
Link Belt Machinery Company, 162.
Link Belt Company's Engineers, Founders, etc., 460.
Local Engineering Data for St. Louis, 412.
Locomotive Running Repairs, 509.
Logarithmic Tables, 414.

Manilla Rope Power Transmission, 163.
Manual Guard Duty, United States Army, 214.
Manual of Irrigation Engineering, 214, 509.
Massachusetts Institute of Technology, Prospectus of, 58.
Master Car & Locomotive Painters' Association of the United States and Canada, Proceedings of the 23d Annual Convention, 57.
Master Car & Locomotive Painters' Association, 23d Annual Convention, 57.
Master Car-Builders' Association, Twenty-seventh Annual Report, 555.
McSherry Manufacturing Company, Catalogue of, 162.
Measurement of Electric Currents, 214.
Mesabi Iron Range in Minnesota, The, 110.
Metal Working Machine Tools, also Steam Hammers, Hydraulic Machinery, etc., Illustrated Catalogue of, 461.
Mexico? Si Señor, 362.
Modern Electric, Steam and Hand Cranes, 162.
Modern Traveling Crane, 363.
Molesworth's Pocket-Book of Engineering Formulæ, 412.
Monographs of the United States Geological Survey, 412.
Municipal Improvements, 214, 314.

Nebraska City Bridge, The, 507.
New Process Balls, 315.
New York Central & Hudson River Railroad Locomotives, 413.
New York Equipment Company Calendar, 58.
New York Safety Steam Power Co. Catalogue, 556.
North American Review, 6, 57.
Notes on the Year's Naval Progress, 5.

Objects of Interest to Engineers and Others, 509.
Official Railway List, 362, 412.
Original Papers on Dynamo Machinery and Allied Subjects, 5.
Our Exhibit, World's Columbian Exposition, Brown & Sharpe Manufacturing Company, 413.
Outing, 6, 57.
Overland Monthly, 7, 57.

Papers on the Subject of Steel Railway Ties, Extracts from Various, 362.
Papers Regarding the Consumption of Wood for Railroad Ties, Extracts from Various, 362.
Pintsch System of Car Lighting by Compressed Oil Gas, 556.
Pittsburgh Locomotive Works Exhibit at the World's Columbian Exhibition, 412.
Poole & Son Company, Robert, 362.
Poor's Hand-Book of Investment Securities, 57.
Poor's Manual of the Railroads of the United States for 1893, 412.
Popular Science Monthly, 7, 57.
Practical Engineer, The, 214.
Practical Treatise on Foundations, 57, 362, 508.
Proceedings of a National Convention of Railroad Commissioners, 362.
Proceedings of the Twenty-third Annual Convention of the Master Car-Painters' Association of the United States and Canada, Held at Detroit, Sept. 14, 15 and 16, 1892, 57.
Proceedings of a National Convention of Railroad Commissioners, 509.
Professional Papers of the Corps of Royal Engineers, 162, 214.
Professional Papers of the Corps of Engineers of the United States Army, 412.
Pumping Machinery, 265, 313.

Railroad Commission of California on Freight Rates, Report to, 58.
Railway, Steamship and Stationary Engine Appliances, Catalogue of, 413.
Reference Map of the United States, 362.
Rensselaer Polytechnic Institute Hand-Book of Information, 509.
Report of the Chief of the Bureau of Medicine and Surgery to the Secretary of the Navy, 1892, 58.
Report of the United States National Museum, un-

der the Direction of the Smithsonian Institute, for the Year ending June 30, 1892, 263.
Report to the Railroad Commission of California upon Just and Equitable Rates of Freights and Fares for the Railroads of California, 58.
Results of Tests of Crucible, Basic and Galvanized Basic Steel Wire Ropes and Basic Steel Wire Rods, 7.
Riehle Brothers Testing Machine Company, 460.
River Pollution and River Purification, 7.
Rogers Locomotive Company, 413.
Root Improved Water-Tube Boiler, 413.
Rules and Regulations Governing Freight Traffic, 214.

Schutte & Company, L., 459.
Science of Mechanics, The, 510.
Scribner's Magazine, 7, 57.
Selected Papers of the Institution of Civil Engineers, 7.
Sewage Treatment and Sludge Disposal, 214.
Siemens & Halske Electric Co. of America, 510.
Sioux City, its Commerce and Manufactures, 59.
Sixth Annual Report of the Interstate Commerce Commission, December, 1892, 58.
Slide Rule, 362.
Standard Steel Works, 316.
Steam Engine Indicator, Practical Instruction Relating to the Construction and Use of, 555.
Steel Castings, The Pittsburgh Steel Casting Company, Pittsburgh, Pa., Catalogue of, 7.
Stevens and his Sons, John, Early American Engineers, 7.
Stone, 7.
Stresses in Statically Indeterminate Structures, 109.
Surveying Instruments and their Uses, 556.
Switch Layouts and Curve Easements, 214.

Tables for the Computation of Railway and Other Earthwork.
Technical Society of the Pacific Coast, Transactions, 58.
Tenth Annual Report of the Board of Railroad Commissioners of Kansas for the Year ending December 1, 1892, 161.
The Chilian Revolution of 1891, 412.
The Coal Trade, 411.
The Compass, 412.
The Delamater Iron Works of New York, 459.
The Edward P. Allis Company Reliance Works, 460.
The Great Lakes Register of Shipping, 412.
The Law of Incorporated Companies Operating under Municipal Franchises, 412.
The Mesabi Iron Range in Minnesota, 110.
The Michigan Engineers' Annual, Containing Proceedings of the Michigan Engineering Society for 1893, 412.
The Niles Tool Works, 460.
Theory and Practice of Modern Frame Structures, 554.
Theory of Structure and Strength of Materials, 108.
Timber Physics, 362.
Tips to Inventors, 6.
Transactions of the American Institute of Electrical Engineers, 214.
Transactions of the Liverpool Engineering Society, 509.
Transactions of the Technical Society of the Pacific Coast, Volume IX, No. 11, 58.
Transition Curve by Offsets and by Deflection Angles, 509.
Transportation, 507.
Treatise on Gear Wheels, 161.
Triangular Surveys from Single Stations, 214.
Turret Machinery, Catalogue of, 363.
Twenty-fourth Annual Report of the Board of Railroad Commissioners of the Commonwealth of Massachusetts, 162.
Twenty-third Annual Report of the State Board of Health of Massachusetts, 7.

United States Geological Survey, 263, 412.

Visitors' Directory to the Engineering Works and Industries of Cleveland, O., 362.

Ward's Patent Sectional Safety High Pressure Boiler, 363.
Water Tower, Pumping and Power Station Designs, 160.
Watson & Stillman, Catalogue, 58.
Wells Balanced Marine Engines, 364.
Weir Frog Company, 413.
White Lead, What we Know about it and its Substitutes, 109.
Whitney & Sons, Messrs. A., 510.
Worcester Drill Grinder, 413.
World's Columbian Exposition at Chicago, 509.
Worthington Steam-Pumping Machinery at the World's Columbian Exhibition, 413.

MISCELLANEOUS ARTICLES.

Accidents to Locomotive Engineers and Firemen, 197, 248, 301, 351, 401, 449, 494, 543, 591.
Accidents to Work People, 128.
Aerial Navigation at the Columbian Exposition, 82.
Aerial Navigation, The Conference on, 415.
Air Ship, Professor Langley's, 207.
Aluminum and its Future Applications, Technical Importance of, 369.
American Railway Association on the Labor Question, President Haines of the, 574.
A Real Work of the Geological Survey, 23.
Argentine Government *versus* Railways, 455.
Armor Trials at Indian Head, 498.
Artillery, Germany's New, 285.
Atlantic Greyhounds, Evolution of the, 587.
Atmospheric Air, Liquefied, 176.

Balls, Forged Steel, 49.
Baltimore & Ohio Exhibit at the World's Fair, 90.
Belknap Motors at the Fair, 502.
Blue Printing in Cloudy Weather, Rapid, 124.
Boiler Inspection, Some Thoughts on, 193.
Boilers, Care of Marine, 535.
Boiler, The Multitubular, 472.
Brass on Annealing, Influence of Temperature on the Mechanical Properties of, 399.
Bridge, Oregon's Cantilever, 198.
British Railways, Hours of Labor on, 355.

Cable Railways, Curve Device, 398.
Caoutchouc Industry of Assam, 343.
Canal, The Corinth, 575.
Canals in India, 23.
Car Coupler Bill, 122.
Care of Brakes, Foundation, 138.
Care of Marine Boilers, 535.
Cars, Weights and Dimensions of Certain Freight, 183.
Channel, The Lake, 21.
Chemical Work, Discrepancy in, 144.
Chignecto Ship Railway, 131.
Chinese Imperial Railway, The, 432.
Coal, The Smokeless Combustion of, 182.
Columbian Exposition, Aerial Navigation at the, 82.
Columbian Exposition Notes, 31, 86.
Columbian Exhibition, 355.
Comparative Durability of Wooden and Metallic Ties, 378.
Concrete, Strength of, 183.
Conference on Aerial Navigation, 415.
Contributions to Practical Railroad Information, Method of Determining Carbon in Iron and Steel, 347, 391; Method of Determining Free Caustic and Carbonated Alkali in Soaps, 199, 251; Method of Determining Sulphur in Steel, 413; Method of Determining Sulphur in Pig and Wrought Iron, 579; Phosphorus in Steel, 16.
Corinth Canal, The, 575.
Corridor Trains, French, 521.
Corridor Trains, German, 333.
Curve Device for Cable Railways, 398.
Cylinder Condensation and Steam Engine Economy, 20.
Cylinder Sizes of Lake Engines, 223.

Delhi Water-Works, 77.
Detentions and Defects of Locomotives, Reports of, 594.
Detentions to Trains from Defective Machinery, Summary of Reports of, 548.
Distribution of Profits to Employees of H. K. Porter & Co., 155.

Electrically Welded Steel Barrels, 326.
Electric Car Lighting on the Northern Railway of France, 126.
Electric Heater, An, 453.
Electric Mine Railway at Bleiberg, in Carinthia, 183.
Engineering Societies of America, 596.
Engineers in Würtemberg, Practical Training of, 516.
Engine Economy, Cylinder Condensation and Steam, 20.
Engine, Novel, Triple-Expansion, 538.
Engines, Cylinder Sizes of Lake, 223.
Engines, Lubrication of Marine, 328.
Evolution of the Atlantic Greyhounds, 587.
Exposition Flyer, 358.

Flying Machine, Phillips's, 349.
Forged Steel Balls, 49.
Four Hundred Miles as the Crow Flies, 504.
Free Technical School, 47.
Freight Cars, Weights and Dimensions of Certain, 183.
French Corridor Trains, 521.

Geodetic Work in France, 72.
Geological Survey, Real Work of, 23.
German Corridor Trains, 333.
German Railways, The New Regulations on, 281.
Germans as Drummers, The, 601.
Germany's New Artillery, 285.
Good Roads, The National League for, 34.
Guns, Notes on Long, 601.

Haines, of the American Railway Association, on the Labor Question, President, 574.
Hours of Labor on British Railways, 355.
Hydraulic Forging Press, Four-Thousand Ton, 133.

Influence of Temperature on the Mechanical Properties of Brass on Annealing, 399.
Iron, Effect of Temperature on the Strength of, 173.
Italian Progress in Transportation Freight, 271.

Jack's Run Viaduct, 414.
John Bull, The, 214.

Krupp's Nickel Steel Cannon, 129.

Labor on British Railways, Hours of, 355.
Labor Question, President Haines, of the American Railway Association, on the, 574.
Lake Channel, The, 21.
Lake Engines, Cylinder Sizes of, 223.
Lamination in Metal, 232.
Langley's Air Ship, 207.
Launches for China, 398.
Liquefied Atmospheric Air, 176.
Locomotive Engineers and Firemen, Accidents to, 301, 351, 401, 449, 494, 543, 591.
Locomotive Returns for September, 42.
Locomotive Returns for the Month of October, '92, 96.
Locomotive Returns for the Month of November, '92, 154.
Locomotive Returns for the Month of December, '92, 206.
Locomotive Returns for the Month of January, '93, 258.
Locomotive Returns for the Month of February, '93, 300.
Locomotive Returns for the Month of March, '93, 350.
Locomotive Returns for the Month of April, '93, 400.
Locomotive Returns for the Month of May, '93, 448.
Locomotive Returns for the Month of June, '93, 496.
Locomotive Returns for the Month of July, '93, 544.
Locomotive Returns for the Month of August, '93, 592.
Locomotives, Reports of Detentions and Defects of, 594.
Locomotives on the New South Wales Railways, English and American, 408.
Long Guns, Notes on, 601.
Lubrication of Marine Engines, 328.

Maddox Cotton and Wire Belting, 549.
Manganine, 498.
Manitou, A New Lake Steamer, 281.
Marine Boilers, Care of, 535.
Mechanical Science, 577.
Metallic Railroad Ties, Tests of, 25.
Metallic Ties, Comparative Durability of Wooden and, 378.
Middlesbrough Salt Industry, 477.
Motion of Flowing Water, 132.
Multitubular Boiler, 472.

New Lake Steamer, The Manitou, 281.
New Regulations on German Railways, 281.
New York and Westinghouse Air-Brake Pumps, Tests of the, 546.
New York Central Railroad Exhibit at Chicago, 254.
Novel Triple-Expansion Engine, 538.

Oldest Railway in Germany, The, 437.

Paint for Lighthouses, 46.
Passenger Cars, Regulations of the Temperature of, 225.
Pennsylvania Train Shed at Jersey City, Ventilation of, 363.
Petroleum Mining at Mendoza, Argentine Republic, South America, 542.
Phillips's Flying Machine, 349.
Piles, Protecting against the Teredo Navalis on the Louisville & Nashville Railroad, 563.
Pneumatic Tubes Abroad, 183.
Porter & Co., Distribution of Profits to Employés of, 155.

MISCELLANEOUS ARTICLES.

Present Status of the United States Timber Tests, 13.
Progress of Transatlantic Navigation, 327.
Progress in Flying Machines, 532, 580.
Protecting Piles against the Toredo Navalis on the Louisville & Nashville Railroad, 563.

Railroad Statistics, 72.
Rifles, The Manufacture of, 79.
Railway in Germany, The Oldest, 437.
Rear-end Collisions, Dangers from, 498.
Rolling Stock Statistics, 583.
Rowell-Potter Automatic System of Block Signals, 550.

Salt Industry, Middlesbrough, 477.
"Sandy Skirled Awa' and Drowned the Electrical Piano," 511.
"Schnebelite," a New Explosive, 537.
Schneider's Nickel Steel Armor for Russia, Trial of, 587.
School, Free Technical, 47.
Screw-Threads for France, A Proposed Uniform System of, 584.
Selection and Treatment of Steel for Forgings, The, 227.
Ships for the Lakes, New, 121.
Smelting and Casting Metals, A New Method of, 241.
Smokeless Combustion of Coal, The, 182.
Special Tools of the Delaware & Hudson Canal Company's Shops, 170.
Specific Gravity with a Platform Scale, Obtaining, 369.
Speeds, Some Extreme, 222.
Steam Engine Economy, Cylinder Condensation and, 20.
Steamer Manitou, The New Lake, 281.
Steam Heating on the Eastern Railway of France, 406.
Steel Barrels, Electrically Welded, 326.
Steel for Forgings, The Selection and Treatment of, 227.
Strength of Concrete, 183.

Tanite Company's Exhibit of Abrasives at the Chicago Exhibition, 552.
Technical Importance of Aluminum and Its Future Applications, 369.
Telescope, Naval Observatory, 155.
Temperature of Passenger Cars, Regulation of the, 225.
Temperature on the Strength of Iron, Effect of, 173.
Tests of the New York and Westinghouse Air-Brake Pumps, 546.
Ties, Comparative Durability of Wooden and Metallic, 378.
Ties, Tests of Metallic Railroad, 25.
Timber Tests, Present Status of the United States, 13.
Toredo Navalis, Protecting Piles against the, on the Louisville & Nashville Railroad, 563.
Train Detentions from Defective Machinery, 548.
Train Detentions, 554.
Training of State Engineers in Würtemberg, Practical, 526.
Transatlantic Navigation, Progress of, 327.
Trials of the Vesuvius, 107.
Turpentine Gathering on the Timber of Longleaf Pine, Effect of, 127.

Ventilation, 368.
Ventilation for the Pennsylvania Train Shed at Jersey City, 365.
Vesuvius's Guns, Report on the, 170.
Vesuvius, Trials of the, 107.

War Ships under Construction, 120.
Water Works, The Delhi, 77.
Westinghouse Air-Brake Company's Exhibit, 405.
Westinghouse Air-Brake Pumps, Tests of the New York and, 546.
Wooden and Metallic Ties, Comparative Durability of, 378.
World's Fair Route, 504.

PERSONAL NOTES.

Allen, A. A., 149.
Anderson, The Hon. T. H., 98.

Baker Submarine Boat, 9.
Beckler, E. H., 599.
Benson, Christopher, 101.
Boller, Alfred P., 254.
Bradley, L. W., 254.
Buchanan, James, 599.

Campbell, R. B., 599.
Chamberlain, Eugene, 101.
Clayton, Thomas G., 499.
Cook, W. I., 50.
Cooper, Theodore, 253.
Croes, J. J. R., 50.

Dagrou, James G., 253.
Davis, Phineas, 599.
Dolbeer, Alonzo, 201.
Du Barry, Joseph N., 50.

Edwards, D. G., 499.
Ely, Theodore N., 201.

Flynn, P. J., 355.
Folger, Commodore, 101.
Fouquet, John D., 547.
Frey, J. J., 149.
Frick, George, 101.
Fritz, John, 101.
Fry, W. H., 253.

Gantt, H. L., 305.
Garlinghouse, F. L., 404.
Gavett, Blaine, 254.
Gilbert, Edward S., 201.
Gillis, H. A., 149.
Goodwin, H. Stanley, 101.
Green, William, 499.

Halladay, J. C., 253.
Harris, Joseph S., 149.
Harvey, Hayward A., 501.
Haselton, George H., 599.
Hill, Edward J., 253.
Hunt, Capt. Alfred E., 50.

Ironmonger, C., 305.

Johann, Jacob, 50.
Johnson, John Taylor, 254.
Johnson, Chas. Roberts, 499.
Jones, Frank, 404.

Kendal, A. E., 305.
Kendrick, C. H., 201.
Kendrik, J. R., 254.

Lawler, C. M., 201.
Lonergan, P. T., 599.
Lewis, Frederick H., 101.
Lord, E. P., 305.

Macbeth, James, 101.
Manchester, A. E., 254.
Martin, Edward H., 101.
Mayo, Dudley D., 254.
McDonald, Hunter, 50.
Medway, John, 50.
McQueen, Walter, 354.
Milholland, Henry A., 50.
Mordecal, Augustus, 50.
Mulcahy, R. K., 201.

Newberry, Prof. John Storey, 50.
Neale, D. H., 254.
Nickerson, Theodore, 547.

Odell, J. T., 599.
Ortton, John, 50.
Ortton, John, 149.

Peddle, Charles R., 254.
Pottinger, David, 50.

Renshaw, William, 201.
Rogers, Jacob S., 254.
Rosenberg, F., 305.
Rudd, A. H., 149.
Russell, E. G., 201.
Ryan, J. J., 305.

Sargent, F. W., 50.
Scheffler, Frederick A., 254.
Scheffler, F. A., 305.
Shoemaker, A. T., 50.
Siemens, Dr. Werner, 50.
Smith, Horace, 101.
Sockridge, H. F., 149.
Stephenson, John, 453.

Towne, Chief Engineer Nathan H., 101.
Tuttle, Lucius, 499.

Van Etten, Edgar, 149.
Van Smith, J., 254.
Voorhees, Theodore, 50.
Voorhees, Gen. Superintendent Theodore, 150.
Vose, Colonel Richard, 201.

Wall, Edward B., 254.
White, W. Howard, 149.
Whitmore, John, 404.

NOTES AND NEWS.

Advertisements Prohibited, 163.
Agricultural Implements in Sicily, 465.
Air-Brakes for Street Cars, 415.
Air Sacks for Wrecking, 450.
Ajax Metal Company Incorporated, 156.
Akron Tool Company, 49, 501.
Aluminum Boats, 576.
Aluminum for Slate Pencils, 68.
Aluminum Soldering, 67.
Aluminum Cutter, 450.
American-English Screw Factory, 52.
American Forestry Association, 102.
American Institute of Mining Engineers, 51.
American Line of Steamers, 112.
American Railway Master Mechanics' Association, Annual Convention, 304.
American Society of Civil Engineers, 51, 102, 148, 253.
American Society of Electrical Engineers, 546.
American Society of Mechanical Engineers, 51, 598.
American Society of Naval Architects and Marine Engineers, 51.
American Society of Naval Engineers, 102.
Ammonia Motor Again, 205.
Amphibious Boat, An, 451.
Amphitrite's Barbettes Completed, The, 120.
Appropriation for Flying Machine Experiments, 365.
Argentine Republic Railroads, 10.
Armor Plates, Large Contracts for, 89.
Armor-Plate Test for the Texas, 305.
Association of Foremen Blacksmiths, 453.
Atlantic Derelict, 112.
Austrian Forestry, 67.
Automatic Block Signaling by the Use of Incandescent Lamps, 463.
Automatic Electric Signal Company, 97.

Bacterial Purification by Light, 113.
Baker, Offices of William C., 49.
Baldwin Locomotive Works, 97.
Baltimore & Ohio Depot at Staten Island, 48.
Baltimore & Ohio Railroad, 256.
Bannockburn, The, 451.
Battleship Iowa, 170.
Battleship Oregon, 596.
Battleship Resolution, 450.
Battleships for the French Navy, 462.
Belt Railroad at Terre Haute, Ind., 156
Bethlehem Iron Company's Exhibit, 250.
Bids for War Vessels, 596.
Bi-metallic Wire, 112.
Blowing up Derelicts, 451.
Blowing up of Derelicts, 516.
Bonaventure, The, 452.
Books Handled by Machinery, 110.
Booth, Garrett & Blair, 98.
Boring to a Depth of 6,360 ft., 559.
Borings for Prince Edward Island Tunnel, 9.
Bosphorus, Electric Lighting of the, 596.
Boston Society of Civil Engineers, 148, 200, 353, 598.
Bow Rudder, 450.
Brick Pavement, 11.
Bridge at Duluth, 110.
British Mercantile Marine, The, 451.
Broke her Shaft, 116.
Broken Rails, 405.
Brooklyn, New Armored Cruiser, 89.
Buffalo, Rochester & Pittsburgh Railroad, 49.
Builders' Iron Foundry, 257.

Canal Project, A Ship, 596.
Carlisle Manufacturing Company, 97.

Cambrian, The, 164.
Cast-Steel Bells, 365.
Chicago Forge & Bolt Company, 257.
Chicago Train Service, 110.
Chignecto Ship Railway, The, 9.
Chloric Germicide, 9.
Civil Engineers' Club of Cincinnati, 598.
Civil Engineers' Club of Cleveland, 149.
Civil Engineers' Society of St. Paul, 102, 253.
Closing of the Sault Ste. Marie Canal, 10.
Coal and the Channel Tunnel, 201.
Coal in Arizona, 111.
Coal for Uses on War Ships, Most Suitable, 597.
Coal Mined throughout the World, 8.
Coal Supply of Europe, 112.
Coaling at Sea, 517.
Coaling Vessels at Sea, 560.
Coast Defense, 89.
Colborne Manufacturing Company, Oliver, 204.
Columbia, Trial of the, 597.
Columbian Engineering Congress, 147.
Columbian Exposition Notes, 250.
Combination Tank Steamer, 116.
Condenser for Exhaust Steam, A Cheap, 560.
Condition of the Chicago, The, 517.
Congdon Brake Shoe Company, 49.
Consolidated Car Heating Company, 49.
Consolidation of the J. A. Fay and Egan Companies of Cincinnati, 150.
Consumption of Coal, 111.
Copper Plating Ships' Bottoms, 596.
Copper Production in the United States in 1892, 68.
Correction, 415.
Cruiser Brooklyn, 35.
Cruiser Concord, 119.
Crushed Steel, 110.
Curious Clock, 357.
Curious Transformation of Brass, 163.

Dam of the Housatonic River, 11.
Deduction of a Right Line, 113.
Defense Nets, Test of, 596.
De Julio, The, 165.
Destroyer to be Tested at Newport, The, 119.
Destruction of a California Dam, 11.
Destruction of Valuable Engines, 111.
Detection of Weak Smoke Tubes in Tram Locomotives, 365.
Determination of the Amount of Chromium in Steel, 365.
Determination of the Quality of Vulcanized Rubber, 415.
Diamond Machine Company, The, 204.
Dietz Passenger Draw-Bar Company, 49.
Disappearance of Wooden Vessels of the Navy, 36.
Dixon Crucible Company, The Joseph, 49.
Dixon Crucible Company, Joseph, 257.
Double Gun Carriage, 597.
Draining Lake Angeline, 49.
Drake Machine Works, J. C., 204.
Dry-Docks at Brooklyn and Puget Sound to be Lengthened, 119.
Dunkirk Engineering Company, 97.

Economy of Gas-Engines, 112.
Efficiency of Boilers, 163.
Electric Car Heater, 204.
Electric Feeder for the Gatling Gun, 463.
Electric Hoists for Whalebacks, 597.
Electric Light in Shore Defense, 596.
Electric Lighthouse, Powerful, 596.
Electric Lighting, A Novelty in, 557.
Electric Lighting of the Bosphorus, 596.
Electric Power for Seattle, 203.
Electric Railway under Paris, 557.
Electric Stop, The, 307.
Electric Transmission of Power, 104.
Electrical Power in Switzerland, 559.
Electrically Controlled Clocks, 558.
Electricity in the Navy, 120.
Engineering Association of the South, 149, 304, 353, 404, 547.
Engineering Society of the South, 305.
Engineering Society of Western Pennsylvania, 453.
Engineers' Club of Cincinnati, 102, 201, 304, 403, 546.
Engineers' Club of Minneapolis, 147.
Engineers' Club of Philadelphia, 201, 353, 598.
Engineers' Club of St. Louis, 147, 201, 546.
Engineers' Society of Western Pennsylvania, 304, 403, 547.
Engine, The Improved Greene, 205.
Ensign Manufacturing Company, The, 97.
Eppinger & Russell Creosoting Works, 256.
European Coal Fields, 356.
Exhibition Number of "Scribner's," 110.
Export of Steel from the United States, 9.

Fast Atlantic Line for Canada, 114.
Fast Boat, 113.
Fast Torpedo Boats, 114.
Fay & Egan Companies of Cincinnati, Consolidation of the J. A., 204.
Ferrules for Marine Boilers, 516.
Ferry Bridge, A, 558.
Fire Protection at Cleveland, 203.
First Australian Locomotives, 10.
Fletcher Company, The W. A., 98.
Folkeston Locomotive, 415.
Foreign Whalebacks for American Trade, 164.
Forest Preservation, 67.
Forests Required to Supply Ties, 201.
For the Pennsylvania Railroad Company, 111.
Frank Kneeland Machine Company, 49.
Franklin Avenue Freight Station in St. Louis, 415.
Freak of Electricity, 357.
French Warship Jurequibberrer, 596.
Fritz Receives the Bessemer Medal, 365.
Furnaces in Blast, 10.
Furnaces in Operation January 1st, 67.

Gas for Passenger Car Lighting, 68.
Gas Holder, A Large, 104.
General Engineering Company, 257.
Geometric Boring Tool, 52.
Giffard Gun, The, 560.
Gilbert Car Company, 49.
Good Roads, 67.
Gordon Disappearing Carriage, The, 463.
Grant Locomotive Works, The, 97.
Great Mersey Bridge, 415.
Great Mississippi River Bridge, 111.
Gun Carriage, Double, 597.

Hankow Iron Works, 11.
Hannan Bridge at Chicago, 11.
Harlem River Lifting Bridge, 68.
Heat of the Sun's Surface, 463.
Heavy Coal Consumption not Unprofitable, 451.
High Smoke-Stack, 462.
Honors to Commodore Melville and Constructor Wilson, 111.
Hyatt Roller Bearing Company, 49.
Hydraulic Pump for Mines, 463.
Hydraulic Ram, A Large, 156.
Hydrophone, The, 513.

Indiana Car and Foundry Company, The, 150.
Indiana's Coal Exhibit, 251.
Infanta Maria Teresa, Spanish Cruiser, 597.
Inter-Continental Railway, 111.
Iron-Ore Shipments from Lake Superior, 11.
Iowa Society of Engineers and Surveyors, 147.

Jaffa and Jerusalem Railway, 110.
Japanese Railroads, 557.
Johnson Railroad Signal Company, 204.
Jurequibberrer, French Warship, 596.

Kenka-Hebler Projectiles, 557.
Kite to Send Life-Lines Ashore, 451.
Krupp Extension, 201.

Lack of Torpedoes, 120.
Laidlaw & Dunn Company, 257.
Lake Erie Engineering Works, 257.
Lake Tulare Irrigation Canal, 11.
La Libertad, 43.
Lansberg Brake Company, 49.
Large Gas-Holder, A, 104.
Large Ship Plates, 516.
Largest Dredge in the World, 450.
Largest Express Engine in the World, 163.
Largest Floating Crane, The, 11.
Largest Freight Steamer in the World, 450.
Largest Order for Car-Heating Material, 49.
Large Steamers for the Southern Pacific Railroad, 357.
Large Steel Plates, 415.
Latest Addition to the Italian Navy, 114.
Launching of a Big Ship, 367.
Launch of the Cruiser Columbus, 11.
Launch of the Hudson, 169.
Launch of the Indiana, 169.
Leaky Tubes, 114.
Lengthening a Steamship, 517.
Lifting Bridge over the Harlem River, 68.
Lighthouse, Powerful Electric, 596.
Lighting Passenger Cars, 68.
Link-Belt Machinery Company, The, 204.
Liverpool Elevated Railroad, 68.
Liverpool Engineering Society, 253.
London Tower, 559.
Longest Balloon Trip, 68.
Long Run with Little Oil, 111.
Long Trolley Road in Pennsylvania, 111.
Loss of Heat in Steam Generation, 68.
Lucania, The, 114.
Lunkenheimer Brass Manufacturing Company, 97.

Magnesia Sectional Covering Company, 204.
Magnetized Towing Drum, A, 451.
Manhattan Equipment Company, 98.
Master Car-Builders' Association, 102, 304.
Master Mechanics' & Car-Builders' Association Next Year, Place of Meeting of the, 598.
Master Mechanics' Association, 51, 102.
Meeting of the Chemical Section, 547.
Montana Society of Civil Engineers, 253, 403, 546.
Mont Blanc Observatory, 463.
Monterey, Trial of, 89.
Morgan Line's New Steamer El Rio, 119.
Mortar in Frosty Weather, 557.
Most Suitable Colors for Signal-Posts and Semaphore-Arms, 464.

Naphtha Cab, 205.
National Car Spring Company, 98.
National Hollow Brake-Beam Company, 98.
Naval Armaments of Europe, The, 517.
Naval Premiums, 415.
New Anemometer, 111.
New Armored Coast-Defense Ship, 114.
New Armor Specifications, 119.
New Explosive, A, 512.
New French Cruiser, 462.
New Idea in Ship-Building, 430.
New Inman Line Steamers, 9.
New Italian Battle-Ship, 116.
New Magazine Gun, 305.
New Method of Casting Steel Ingots, 464.
New Method of Rolling Old Steel Rails, 366.
New Railroads in 1892, 68.
New Shaft for the Umbria, 116.
New Ships for the International Steamship Company, 111.
New Ships of the Monitor Type, 120.
New Smokeless Powder, 463.
New Sound Steamer, A, 104.
New Steamer for the Old Colony Line, 110.
New Steamer for Fall River Line, 451.
New Steamers for the Hamburg-American Line, 516.
New Steamers for the Lakes, 168.
New York Central & Hudson River Railroad Company, 256.
New York, New Jersey & Eastern Railway Company Tunnel, 9.
New Railroad Mileage in 1892, 68.
New York Railroad Club, 51, 147, 200, 498, 546.
New York Safety Car-Heating and Lighting Company, 98.
Northwestern Railway Club, 403.
Northwest Railroad Club, 102.
Novel Method of Photographing the Camp of an Enemy, 365.
Novel Street Railway, 356.

Oil-Distributing Sea Anchor, 461.
On the Life of Iron Bridges, 513.
Oregon, Battleship, 596.
Oregon's Armor Plating, The, 119.

Palleograph, 557.
Panhandle Trestle, 356.
Passenger Car Truck, 68.
Peat as Fuel, 357.
Pennsylvania Steel Refining Company, 49.
Peruvian Trans-Andean Railway, 558.
Persian Telegraph Line, 464.
Phonograph as a Cure for Deafness, The, 513.
Pittsburgh Testing Laboratory of Hunt & Clapp, 98.
Police Boat for New York Harbor, 597.
Pollution of the Seine by Paris Sewage, 9.
Polyphemus, The, 516.
Powdered Coal and Smoke, 368.
Preservation of the Adirondack Forests, 67.
Pressure Regulators, 501.
Preventive of Timber Rot, 236.
Proceedings of Societies, 51, 102.
Properties of Matter at very Low Temperatures, 113.
Pyrometers, High-Temperature, 557.

Railroads in Newfoundland, 512.
Railway, A Curious, 597.
Railway to Victoria Nyanza, 557.
Railways of the United States, 558.
Ram for Coast Defense, 34.
Rapid-Fire Guns, 34.
Rapid-Fire Guns, Test of, 559.
Raymond Brothers Impact Pulverizer Manufacturing Company, 204.
Readjusting a Misfit Jacket, 112.
Reciprocating Mechanism, Automatic Balance for, 557.
Reclamation of the Zuyder Zee, The, 9.
Regularity of the Turning of Steam Vessels, 461.
Relative Visibility of White and Colored Lights, 9.
Remarkable Artesian Well-Boring, 163.
Repairs to the Umbria Shafts, 68.
Report of Chief-Engineer United States Navy, 35.
Report of the Board on Ordnance and Fortifications, 10.
Report of Yards and Docks, 35.
Rhode Island Locomotive Works, 98.
Richmond Locomotive Works, 49.
Riehle Brothers Testing Machine Company, 204, 259.
Rifle for Canadian Volunteers, 551.
Rifle Trenching-Tool, A, 512.
Road Improvement in the State of New York, 67.
Road Improvement in the State of Pennsylvania, 67.
Roadmasters, Association of American, 51.
Roanoke Machine Works, 49.
Rolling Stock of the Holland Railways, 305.
Russian Cruiser Rurik, 43.

Safe for Express Messengers, 465.
Safety Metallic Tie Company, 49.
St. Louis Bay Drawbridge, 557.
Santiago de Cuba, 8.
Sargent Company, 204.
Schenectady Locomotive Works, 49.
Schenectady Locomotive Works, The, 97.
Schirm Flash Light, 9.
Schoen Pressed Steel Brake-Beam, 49.
Scrap-Iron Chain Cables, 516.
Sellers & Company Shops, William, 49.
Ship-Building in the United Kingdom, 114.
Ship Canal Project, A, 596.
Ship on Rollers, 596.
Shore Defense, Electric Light in, 590.
Signaling Direct to a Locomotive, 305.
Simplex and the Huge Torpedo, 451.
Sims-Edison Torpedo, 10.
Singular Drainage Arrangements, 465.
Snow Blockade on a French Railway, 367.

Social Reunion of the American Society of Mechanical Engineers, 147.
Society of Naval Architects and Marine Engineers, 547.
Soldering Aluminum, 67.
Southern and Southwestern Railroad Club, 102.
Spanish Cruiser Infanta Maria Teresa, 597.
Speaking at the Engineering Congress at the World's Fair, 513.
Spontaneous Combustion of Coal, 367.
Staten Island Industries, 204.
St. Charles Car Company, 98.
Steamer, A New Sound, 104.
Steam Artillery Wagon, A, 512.
Steamer Building at Cleveland, 10.
Steam from Molten Slag, 558.
Steam Hammer on Board Ship, 164.
Steel Chords Broken, 452.
Steel Crank Shaft, A, 516.
Steel Rail Mills, 11.
Stillwell-Bierce and Smith-Vaile Company, 49.
Storage Battery Electric Car, 9.
Submarine Foundations Made by Solidifying Sand, 464.
Submarine Sentries, 516.
Subterranean River System, 104.
Suppressed Patent Improvements, 111.

Tail Shaft Preserver, 462.
Tanite Company, 551.
Tank Ship for Cotton-Seed Oil, 516.
Technical Society of the Pacific Coast, 499, 599.
Telephone for Diving Purposes, 596.
Telephone Wire, 557.
Testing the Hardness of Metals, 366.
Test of Armor Plates, 367.
Test of Armor-Piercing Shells, 366.
Test of Smokeless Powder, 405.
Test of Holtzer Projectiles at Sandy Hook, 463.
Tests of Indiana Building Stones, 8.
Third Avenue Bridge in New York, 558.
Thirteen-in. Gun for the United States Navy, 463.
Three Classes in Europe, 365.
Torpedo Boats for the Maine and Texas, 89.
Torpedo Cruiser, 89.
Trajectory of a Big Gun, 462.
Transfer Boat Ann Arbor, 34.
Transfer Boats as War Ships, 119.
Trans-Alpine Tunnel, A New, 557.
Trans-Siberian Railway, 305.
Transmission of Power by Electricity, 104.
Traveling Engineers' Association, 51.
Tree Planting on Railroad Slopes, 67.
Trial of a New Solarometer, 169.
Trial of Harvey Steel Armor-Plate, 113.
Trial of the Cruiser Bancroft, 120.
Trial of the Vesuvius, 35.
Trial Trip of the Columbia, 461.
Trolley System for Boats on the Colorado River, 450.
Truck for Long Passenger Cars, 68.
Tube-Plate Boring-Tool, 512.
Turbine Water Wheels for Niagara, 537.
Twin-Screw Steamer for Hamburg-American Packet Company, 9.
Two British Cruisers, 461.
Two New English Battle-Ships, 461.
Umbria's Shaft, Repair of, 68.
Underground and Overhead Railways, 548.
Union Pacific Railroad, 98.
United States Army Balloon, 250.
United States Navy Coast-Defense Ship Monterey, 89.
United States Navy New Armored Cruiser Brooklyn, 89.
United States Engineer Corps, 10.
Unloading Petroleum at Madras, 385.
Utilization of Heat in Steam Engines, 68.

Ventilation for the Pennsylvania Train Shed at Jersey City, 365.
Victoria, 516.
Viking Ship, 163.
Visibility of Colored Lights, 452.

Walburn-Swenson Company, 40.
War Vessels, Bids for, 506.
Weight of a Crowd, 112.
Weisel & Victor Machine Company, 49.
Welding Steel, 305.
Western Society of Engineers, 102.
Westinghouse, Church, Kerr & Company, 257.
Westinghouse Machine Company, 257.
Whalebacks, Electric Hoists for, 597.
Wheeler Condenser and Engineering Works, 256.
When Coal was First Used, 465.
Wilmot & Hobbs Oiler, 551.
Work on Coast Fortifications, 10.

Yerkes Telescope, 9.